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PROPOSAL FOR THE CREATION OF AN ASSESSMENT SIMULATION TASK TEAM FOR THE JUMBO FLYING SQUID IN THE SOUTHEASTERN PACIFIC OCEAN

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SUMMARY

Strong evidence of the complex population structure of the jumbo flying squid (*Dosidicus gigas*) in the Eastern Pacific Ocean exists. Three morphotypes with different size ranges, maturity sizes, and spatial distribution have been described for this species. Currently, three stock assessment models are under discussion in the context of the SPRFMO. However, these models do not take into account the biological and ecological knowledge of the species. Therefore, the creation of an Assessment Simulation Task Team (ASTT) for the jumbo flying squid assessment with simulated data is proposed. The objective of the ASTT is to test the robustness of proposed models to the multiple uncertainties in the population structure of jumbo flying squid. Thus, simulated assessment can provide understanding of the uncertainties associated with the use of those assessment models and the impacts on the management of the resource.

1. Introduction

Currently, there are difficulties in assessing cephalopods worldwide given the life history of this resource and the information available from fisheries. In these species, with particular biological characteristics (e.g. high phenotypic plasticity, rapid growth, short lifespan, among others), it is difficult to develop a tool that attempts to reproduce its population dynamics in a more realistic manner ([Arkhipkin et al. 2021](#)), even more if there is evidence of a complex population structure as in the case of the jumbo flying squid *Dosidicus gigas* ([Arguelles et al. 2001, 2017, 2019, 2019, 2023a, 2023b](#), [Csirke et al 2018](#), [Fang et al 2017](#), [Gretchina & Zúñiga 2017 and 2018](#), [Nigmatullin et al. 2001](#), [Payá 2019](#), [Xu et al 2018](#)). The jumbo flying squid in the Eastern Pacific Ocean presents high

variability in size at maturity, as was described by [Nigmatullin et al. \(2001\)](#) where three groups with different size ranges, maturity sizes and spatial distribution are mentioned.

Despite these difficulties, within the framework of the SPRFMO, efforts have been made to implement models that attempt to reproduce the population dynamics of *D. gigas*. Within the SPRFMO Jumbo Flying Squid Working Group, preliminary assessment models have been presented (China: [Xu et al 2018 - SC6-SQ06](#), Peru: [Cordue et al. 2018 - SC6-SQ07](#)), whose implementation required biological information (e.g., size, maturity) throughout its distribution area. Subsequently, three models presented during SC 10 ([SPRFMO SC10-Report 2022](#)) were discussed. To date, three models are under discussion ([SC11-SQ07](#), [SC11-SQ08](#) and [SC11-Obs03](#)). However, one limitation of these models is that they work on the assumption of a single population with the same longevity, length at maturity, growth rate, and natural mortality throughout the extensive range of distribution of the jumbo flying squid.

In this sense, the creation of **an Assessment Simulation Task Team (ASTT) for the jumbo flying squid assessment with simulated data is proposed**. This proposal is based on the precedent of the evaluation of models with simulated data for the Jack mackerel ([SP-07-SWG-JM-01](#), [SWG-09-JM-01](#), [SWG-09-JM-02A](#)). Also, the ASTT will test the robustness of the proposed models to the multiple uncertainties in the population structure of jumbo flying squid (i.e. existence of at least three clearly differentiated morphotypes in the Southeastern Pacific according to [Arkhipkin et al. 2021](#), and provide understanding of the uncertainties associated with the use of the proposed assessment models and its impacts on the management of the resource. This document presents the objectives of the group, the requirements for the simulated data generated, and the Terms of Reference for the activities of the group.

2. Simulated data requirements

The simulated data should fulfill the following requirements:

- i) **Biology**: to reproduce the different morphotypes of jumbo flying squid identified in the Southeastern Pacific ([Nigmatullin et al. 2001](#)), considering their differences in both growth and size at first maturity.
- ii) **Ecology**: to consider ontogenetic migrations reported in the literature (e.g. [Csirke et al. 2015](#), [Hu et al. 2022](#)), as well as the high degree of cannibalism observed in this species. To consider the effect of climate variability on key parameters related to the life history of this species (e.g., growth, natural mortality, among others).
- iii) **Fisheries**: to take into account the differences in selectivity among the various fleets operating on this species in the Southeastern Pacific, both at the size level (e.g., offshore vs. inshore fleets) and sex level (e.g., trawl vs. jigging).
- iv) **Sampling**: to consider different uncertainty scenarios associated with different levels of sampling effort (e.g., observer coverage, number of ports sampled).
- v) **Data reporting**: to produce both aggregate statistics (i.e., catches, average sizes) and disaggregated data by size, fishing area, and fleet type, consistent with standardization of sampling effort among Members.

3. Terms of Reference

The objective of the ASTT is to test the robustness of proposed models to the multiple uncertainties in the population structure of jumbo flying squid.

The ASTT has the following Terms of Reference:

- Generate simulated data consistent with the requirements described above (section 2).
- Elaborate a protocol for the comparison of candidate models for the jumbo flying squid stock assessment in the Southeastern Pacific.
- Apply this protocol for the comparison of candidate assessment models.
- Produce a realistic simulation model of the population dynamics of the jumbo flying squid in the Southeastern Pacific for its future use as operative model in a management strategy evaluation (MSE) context.
- Report the results to the Scientific Committee.

The activities of the ASTT will require several virtual meetings and an in-person final workshop to discuss the obtained results and draft a final report for the SC.

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